

# Psychological Bulletin

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THE  
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## GENERAL REVIEWS AND SUMMARIES

## INTROSPECTION AND GENERAL METHODS

BY KARL M. DALLENBACH

*Cornell University*

What is introspection? Pepper (9) in his article of that title takes up the answer systematically. He begins his paper by considering the influences which have tended to differentiate introspection from the method of the objective sciences; and then takes up the methods historically showing; first, that introspection is the older, indeed, "That the objective method developed out of introspection:" and secondly, that there is no qualitative difference between them. The latter is his thesis, which he develops (1) by the exposition and criticism of Titchener's analysis of introspection, which he, in opposition to Titchener, shows to be equally applicable to the objective methods; and (2) by the consideration of the kinds of processes studied, which furnishes him with a cue for the differentiation, which "is simply this, the objective data are picked, whereas introspective data are anything that comes along." Following this lead, he finds that in "a thoroughly developed objective science nothing is acceptable but visual data," whereas "the introspective method will accept any kind of experiences whatsoever as fit material for its processes." His conclusion is: "the distinction between the objective and introspective methods resides in the kind of processes described."

Of his thesis, that there is no qualitative difference between the two methods, there is no criticism; but not so of the arguments advanced in favor of his conclusion. They show a complete misunderstanding of the subject. His criticism of Titchener reveals a like condition; it is valid only in so far as it rests upon his exposition of Titchener which is garbled beyond recognition.

After raising and meeting the objections against introspection brought forward by certain behaviorists, Laird (7) arrives at the conclusion that "it seems both legitimate and necessary to assume that introspection has the same general characteristics as any other mental process by means of which we are able to apprehend the truth of fact." He then comes to the thesis of his paper which is that introspection, which is a "kind of cognition," ought to be regarded as a legitimate method of apprehending the mental phenomena "in spite of the numerous objections to this view which are either expressed or implied in contemporary psychology and philosophy."

The objections usually raised against introspection are classified and discussed under three heads: (1) its possibility, (2) its fallibility, and (3) its necessity. Laird's conclusions regarding these questions are: (1) that it is possible; that "there is no intrinsic absurdity in supposing that introspection is a process of direct cognitive acquaintance with our own minds;" (2) that it is not necessarily fallible; "Nothing can be transformed in any sense whatever simply owing to the fact that it is known," and (3) that it is necessary if we are to know the mind for ". . . introspection is the only means of direct acquaintance with the mind," because none of ". . . the characteristic of consciousness can be discovered by other than introspective methods."

After giving a brief history of psychology, Lalande (8) considers next the province, the objects, and the methods. The province of psychology is discussed under four headings: "(1) *Psychologie de réaction*; (2) *Psychologie de conscience ou de sympathie*; (3) *Psychologie réflexive et critique*; and (4) *Psychologie ontologique*."

Under methods, he takes up the introspective, the comparative, and that of the laboratory. The objections to introspection, he finds, "sont beaucoup plus théoriques que pratiques," and "elles ne détruisent pas la possibilité de l'introspection." In order to insure greater accuracy in introspection Lalande lays down five precautions: (1) the observed facts should be recorded as soon as possible; (2) many observations should be made in order that general results may be distinguished from individual; (3) the questionnaire and interrogatory methods do not give the psychological representations or the reasons which produced the subjects' responses, but simply crude results; (4) first-hand knowledge of the phenomena described is very useful and perhaps indispensable for a correct interpretation of the results; and (5) since auto-suggestion,



even with the most critical minds, is extremely easy, the reports should be surrounded by such conditions that the observers are unaware of the expected results. A separate chapter is devoted to the introspection employed in experimental work.

Lalande next treats the comparative methods, which he discusses under the following headings: (1) the pathological and psycho-analytical method; (2) the sociological and genetic methods; and (3) the methods of animal psychology. After which the most common of the laboratory and statistical methods are mentioned, and the article is concluded by a discussion of terminology.

Bourdon, in a short article (4), has attempted to reopen the controversy which for many years centered about Fechner's formulation of Weber's law. After pointing out the well known fact that Fechner's formulation differed from Weber's, he turns to his thesis, which is to show that the distinction and opposition of sensation and stimulus is an error. Both are alike; they are one and the same thing. He points in proof of this to the fact that "*Le psychologue et le physicien opèrent . . . incontestablement, sur les mêmes phénomènes et procèdent essentiellement de la même manière.*" In order to establish this argument, he reviews the traditional experiments—the shadow experiments and the lifted weight experiments—and shows that the psychologist in each and every one of them is judging the same phenomena and judging them essentially in the same way as the physicist. His conclusions therefore are that "*La loi de Weber ne doit pas être formulée de telle manière qu'elle implique une opposition de la sensation et de l'excitant;*" that "*La loi de Fechner doit être rejetée,*" for "*Fechner a mesuré, sous le nom de sensations et d'excitants, les mêmes phénomènes;*" and that "*Les sensations, en tant qu'opposées aux excitants, sont des fictions.*"

This article might well have appeared during the heat of the historical controversy, but it is difficult to understand why any one conversant with the psychophysics of the present day should take such a position.

The object of Thomson's (12) paper is "to show how the Constant or Fechner-Müller-Urban process of calculating thresholds can be deduced from first principles." He, in his opening paragraph, summarizes the article as follows: "The historical development of the process is first traced, and then contrasted with direct deduction. The latter throws into clearer relief the nature of the assumptions and approximations made, and justifies Urban's, as

against Müller's, Table of Weights." The article is apparently an excerpt from the paper with which Thomson won the prize of \$100 offered in 1914 and awarded in 1919 for the best paper on the Availability of Pearson's Formulæ for Psychophysics.

Johnson (6) publishes a note on Dunlap's method of determining the mean variation, in which he calls attention to a misprint in the original article of a *plus* for a *minus* sign in one of the formulae; points out that not only the application but also the method itself was developed by Dunlap; and adds another rule to the two given by Dunlap.

Boring has contributed three articles (1, 2, 3) to the general subject of statistical treatment of data. The first of these (1), "Mathematical *vs.* scientific significance," deals with the "apparent inconsistency between scientific intuition and mathematical result." After briefly reviewing the customary methods of determining the "significance" and "probability of difference," he mentions the common experience of those working with human data that "these methods frequently give values that are, on the basis of professional opinion, too high." This particular attitude is, he maintains, not due to the unreliability of professional opinion, but to the fact that the samples from which the "significance" is computed, even with the best methods of selecting the "unselected data," are frequently not representative of the total group. So the competent man, cognizant of this, "very often discards his mathematical results because in his judgment the mathematically 'significant' difference is nevertheless not large compared with what he believes is the discrepancy between his samples and the larger groups which they represent." All of which merely emphasizes the point with which Boring is concerned, namely that "statistical ability divorced from scientific intimacy leads nowhere."

In his second article (2) on "The logic of the normal law of error in mental measurement," which he tells us was the outgrowth of certain perplexing questions that arose in the Surgeon General's Office U. S. A. in connection with the ratings of recruits in the Army intelligence tests, Boring examines, first, the *Nature of probability*, considering it both historically and logically; and then the *Rôle of the Law of Error*, which he regards as "both an inspiration and a limitation in statistical measurement." This, too, he treats historically, considering its formulation by Laplace, its development by Gauss, its uncritical extension by Quetelet, its *a priori* application by Galton and the English school of biometricians,

the reaction against it lead by Lexis and Westergaard in Germany and to a lesser degree by Galton and Pearson in England; and he thus comes down to the present, where he considers its naïve and oftentimes unwarranted acceptance. A rather flagrant case is cited, and criticized in his third article (3) which is on the "A priori use of the Gaussian Law."

It is against the blind acceptance of the normal law, the Gaussian fetish, that he inveighs, and the sole purpose of this part of the second article is to remind the reader that there is no "magic to the normal law," and that there is no a priori reason for expecting it, but that, quite on the contrary, "we have considerable reason to expect not to find it, since the form of distribution depends on the unit of measurement, and we have arbitrarily chosen one of a possible infinite number of units."

After mentioning in illustration two experiments in which this problem arose,—in one the limitation of the normal curve was recognized and the observed facts were adhered to, and in the other there was a naïve acceptance of the law and a calibration of the material affected by reference to it,—he proceeds to show that belief in the universality of the normal law is due to analogy, which to a certain extent is justifiable in (1) games of chance and (2) digital expansion of numbers, where within each universe the same scale of units is throughout employed. In the distribution of (3) physical measurements, (4) mental measurements, and (5) psychophysical judgments the predication of the normal law is entirely another matter. With (3) the physical measurements the generalization is 'approximately' correct, "for a certain amount of alteration of the scale still leaves a sensibly normal curve;" but in (4) mental measurement, where a unit is still wanting, "we are very far . . . from a general conclusion that intelligence is normally distributed, and still farther . . . from stating that mental abilities follow the normal law." With (5) psychophysical judgments the generalization is permissible, when the scale and the judgments are related, as in the cases when the reports are judgments of stimulus, but not in "introspective" psychophysics where the judgments are given in terms of sensation, and are thus in no way related to the physical scale of units chosen.

For work in mental measurement there are four logical possibilities: (1) The a priori determination of the form of distribution,—a popular course, but without sanction and to be resisted; (2) the determination of the distribution from the psychological unit,—but

no applicable psychological unit has as yet been found; (3) in lieu of this, the determination of the distribution by some arbitrary "physical unit" such as year (mental age), second (time-measure), item (task test), gram (lifted weights), etc.,— but a physical unit is not a mental unit and can not be applied psychologically; and (4) the determination of the rank-orders of our psychological quantities,—the only procedure which at present is justified, since no unit is presupposed, and though the results are less intricate than those obtained by any of the other alternatives, a picture is represented by the serial constants "which, though rough, truly represents the rough material which they describe."

This series of papers can be read with profit by every student of statistical methods, particularly those working in the applied fields, in the standarization of mental tests, etc., for it is they who most frequently succumb to the "Gaussian fetish."

Another appeal to first principles in mental tests is made by Ruml (11), in an excellent article on "The Need for an Examination of Certain Hypotheses in Mental Tests." Deploing the fact that little of theoretical value has come from the work in mental tests, he calls into question three of the fundamental hypotheses which serve as the basis for all testing work.

He questions, first, the belief that general intelligence, even in quantitative terms, can be expressed as a linear or one-dimensional function; secondly, the supposition of linear regressions between test performance and general intelligence; and thirdly, the assumption of a static intelligence level, an assumption which "is necessary to mental test work as it is now conceived."

His explanation of the failure of theory to keep abreast of practice is: (1) That it is due to the historical derivation of mental tests; (2) that it is due to the inertia of thinking; (3) that it is due to bias, which may be attributed "to the nature of the terms in which the results have been expressed," and to the type of analysis "which our limited and frequently misused statistical technique makes possible"; and (4) that it is due to a willingness "to accept statistical hypotheses as applied to intelligence simply to have statistical technique available for use."

Herring (5), in an article which is a continuation of an earlier work, explains the method and technique that he employed in the development of his scale to measure abilities in scientific thinking.

The paper is divided into six parts. In Part I. he sets forth the principle under which he works, "that mental abilities are

distributed as are physical traits," *i.e.*, they are distributed according to the probability curve, and the assumptions made under it, which are, "first, the distribution of the abilities to be studied is normal; and second, the variability of each large randomly selected group of pupils is approximately the same as that of any other." In Part II, in order to establish the validity of his method, he considers the probability curve, explains the P. E. and his use of it as a unit of measure; and defines the terms and relations which he uses. In Parts III, IV, V, and VI the steps employed in the derivation of the scale are completely described.

Herring's exposition is very clear and definite. It is regrettable, however, that he did not spend more thought upon fundamental considerations. As it is, the article is a good example of the kind of work criticized by Boring and Ruml. The hypotheses upon which he constructs his scale are naively accepted as if incontrovertibly established.

Thurstone, in the exposition of his examination for College entrance (14), discusses the methods of evaluating the tests. His plea is for practicality, and to this end he discards the method of multiple correlation as a means of analysis and employs in its stead the method of "critical scores." This method consists "simply in plotting a scatter diagram for each test, showing relation between scholastic attainment and mental test score for each individual. An upper critical score is selected such that all who score above it are above the average in scholastic attainment. A lower critical score is selected such that all who score below it are below the average in scholastic attainment. . . . When the tests are combined . . . the median percentile rank is corrected by adding five points for each test in which the subject is above the upper critical score and deducting five points for each test in which the subject is below the lower critical score." The question that automatically rises at this point is: why five? Thurston offers no explanation for his selection of this value. It seems, however, to be satisfactory. The chief advantages of the method are: (1) it is more controllable than the method of multiple correlation for establishing diagnostically significant criteria; (2) it is easily applied; and (3) it emphasizes "prognosis with respect to each individual student rather than the abstract statement of relationship between the variables concerned."

Thurstone's plea touched a sympathetic chord in Pressey, who in a note of appreciation (10) offers three suggestions which would



further "the consideration of the practical problems of individual diagnosis in evaluating mental tests." The first deals with the method of evaluating the tests, and the second and third with the form in which the findings of the examination should be reported.

Another article which questions the tenets of technological psychology is published by Thorndike (13). It is on the constant error in psychological ratings.

Thorndike finds from a review of number of studies on ratings—studies made of employes in two large industrial corporations, of cadets in the aviation corps, of officers in the army, and of school teachers—that there is a "constant error toward suffusing ratings of special features with a halo belonging to the individual." He arrives at this judgment because the correlations between the different traits estimated "are too high and too even." "Obviously a halo of general merit is extended to influence the rating for the special ability, of vice versa."

As a consequence of this study Thorndike "has become convinced that even a very capable foreman, employer, teacher, or department head is unable to treat an individual as a compound of separate qualities, and to assign a magnitude to each of these in independence of the others." Therefore, "science seems to demand that, in all work on ratings for qualities, the observer should report the evidence, not a rating, and the rating should be given on the evidence to each quality separately without knowledge of the evidence concerning any other quality in the same individual."

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## WORK, FATIGUE AND INHIBITION

BY F. C. DOCKERAY

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The interest in experimental investigation in this field is usually about equally divided between psychologists and physiologists. During the past three years, covered by this review, more attention seems to have been devoted to work and fatigue by the physiologists, due apparently quite largely to the demands of industry during a time when war conditions were putting the stress upon physical efficiency. It may also be true that the psychologist has felt the apparent futility of psychological investigation with the present methods. However, there have been some creditable investigations in the psychology of work and fatigue.

The influence of various degrees of knowledge of results during physical work has been investigated by Arps (3, 4). A Bergstrom ergograph was used. Three subjects, after long training, performed four "known" and four "unknown" series. A series consisted of eleven periods. Rests were introduced between every ten lifts, ranging from 0 to 10 seconds. In addition to the objective records, the introspective reports of the subjects were regularly recorded. It was found that both the absolute amount and the rate of work was greater with knowledge of results than without knowledge. But, as the experiments progressed, the differences were considerably reduced. This is assumed, on the basis of the introspective reports, to be due to experience and visual and kinæsthetic imagery. Habituation to the maximum volume of effort under the two conditions reduce to the minimum the efficiency difference. That there is still greater efficiency with complete knowledge is explained on the basis of a reënforcement of the neuro-muscular chain by the afferent channels from the eyes. When the work reaches the point of exhaustion a peculiar phenomenon of recovery appears, which can not be identified with the phenomena of fatigue. They are explained as more likely due to a functional grouping of neurones connected with the group of muscles involved.

The graphic recording of motor adjustments has received attention from various quarters. Morgan (31) required his subjects

to lift weights by pulling a rope, while the time was recorded in hundredths of a second. In the first series they were required to pull at their maximum speed and in the second series they were to attempt to pull at a speed that would equalize the pull according to the weight used. He concludes that the experiment is inadequate to answer the question as to whether one can control the force independently of time and extent of movement. Levick (26, 27) recorded the response to a single stimulus, a constant current, by means of a tambour transmission myograph and found departures from the normal which he claims can not be seen without such a method. His observations were made on human subjects. A muscle, when stimulated at various intensities, responds with contractures of various intensities, but of equal duration, whether the stimulus is long or short. Impairment of the motor nerve caused a lengthening of the response. Galleotti (11) and Gemelli (13) report briefly their work on the perception and control of muscular movement with the idea of its application to aviation. Galleotti required his subjects, blindfolded, to hold a lever in a specified position while a weight suspended from the lever was varied from two to twelve kilograms. The movements of the lever were recorded on a kymograph. The results are summarized as follows: (1) Excellent curve, indicating excellent aptitude. The curve remains in the middle zone of the tracing. (2) Mediocre curve, ascending and descending with not very high nor uniform variations. (3) Poor curves, which indicate inaptitude rightly to regulate the muscular activity, deformed with great indentations and jumps. In Gemelli's experiments the subject was required to move the lever against a fixed resistance. The time required for the movement and the accuracy of judgment of effort required were taken as a measure not of his motor ability, but of his attention ability. The success in the application of these results to aviation pilots apparently has not yet been published.

Robach (33) has presented an extensive analysis of the interference of voluntary impulses. His problem was to investigate the phenomena, conscious and unconscious, resulting from a condition of rapidly alternating impulses. Green dots and red crosses were exposed at a constantly increasing or decreasing rate. The subject was required to tap twice on one key for one and twice on another key for the other. A series required slightly over three minutes. The objective and introspective records indicated that the primary determining tendency was the direction of least effort.

More omissions and fewer additions were made on the more difficult key. Additions following omissions were explained as due to a secondary tendency of an attempt to carry out instructions. Rhythm was expressed by (a) seemingly automatic repetition, (b) repetition of the same mistakes, (c) creating spontaneous rhythm and (d) by stopping on odd numbers. Grouping of mistakes seemed due to attention being fixed on one mistake. An attempt is made by the author to apply the results to education and ethics, the idea being that it may be possible to find dynamogenic and inhibitive types.

Bethe (8) has observed the voluntary control of antagonistic muscles. The observations were made on soldiers with arms amputated midway between two joints. Hooks were attached to the flexors and extensors. At first contraction of one set was accompanied by relaxation of the other in spite of the voluntary effort of the subject. By practice, however, this relaxation was partially overcome.

Another investigation of mental fatigue in school children has been made by the use of addition. Garth (12) tested over 700 school children in the third and fourth and the seventh and eighth grades. Each group added for two minute periods, the former group for a total of twenty-eight minutes, and the latter for forty-two minutes. The results vary from zero to five per cent. decrease in efficiency in the final period. An analysis is made of variability, practice effects and related phenomena. Thorndike (36) distinguishes between the curve of work and the curve of "satisfyingness." Twenty-nine adults worked two hours and five, four hours, grading printed compositions. The speed and accuracy of the work were recorded by twenty minute periods. The subjects also recorded at the end of each period on a basis of 0 to 10 their degree of "satisfyingness" or feeling of fatigue. The results indicate that, though speed and accuracy are very little affected, "satisfyingness" has gradually decreased in a marked degree throughout the period. Berliner (7) reports the influence of the day's work upon visual imagery. Her subjects were shown a picture for five seconds. Then, after sitting with eyes closed for thirty seconds, they attempted to recall a visual image of the picture. The time of recall and duration of the image were recorded on a kymograph. The duration of the image was greater in the morning. The effect of mental work on physical efficiency is briefly presented by Zondek (44). Writing for a given period



constituted the so-called mental work. By means of a Weber ergograph, the leg muscles were shown to be fatigued. It was assumed that fatigue products generated in the brain, affected the muscles by way of the blood stream. Unfortunately no account seems to have been taken of muscular contraction or change in circulation during the writing.

Ryan and Gordon (34) have attempted to find better methods of measuring fatigue quantitatively. Visual acuity, copying and the systolic and diastolic blood pressures proved negative. The vascular skin reaction, or the observation of the duration of the appearance of the white line produced by stroking the skin with a blunt point was used. Physical exercise decreased fading time and rest increased it.

Tonus and tetanus are believed by Hoffmann (19) to be the same. The tonus reflexes apparently are not susceptible to fatigue. After greatly fatiguing the extensors of the foot by repeated standing on tip toe, the posterior tibial nerve was stimulated by the induction current. A series of reflex action currents were obtained which were identical to those of the fresh muscle, indicating that the reflex centers were not fatigued. He concludes that it is probable the nerve end organs of the tendon reflex, probably the sensory ending in the muscle, are as little susceptible to fatigue as the reflex arc in the spinal cord. Marni (29), working with the synapse of Mauthner, found the cell body smaller after slight over-activity, but shrunken with exhaustion. The Nissl bodies were in a state of chromatolysis. The synapse showed a number of amoeboid glia cells, showing that catabolism processes occur in the synapse as the effect of pathological nutritive conditions in fatigue.

A number of experiments with the chemical products of fatigue tend to confirm the earlier results of Lee and Burrige and extend the results regarding the counter effect of adrenalin. On the other hand Lee and Aronovitch (24) are lead to believe Weichardt's theory of fatigue toxin can not be confirmed. When the juice pressed from a fatigued animal was perfused into a normal animal or an excised muscle, the latter presented all the symptoms of fatigue, but the same effects were produced when the juice from a normal animal was used. Scott (35) is of the same opinion, suggesting that substances carrying  $H$  ions are the causal agents of fatigue. Certain products of protein disintegration may also produce fatigue symptoms. Gunzberg (18) observed the gastrocnemius of the frog perfused with Ringer's solution. Bubbling oxygen through the

solution prolonged the curve of work. The use of  $\text{CO}_2$  had the opposite effect. He explains the staircase effect as due to the metabolic process necessary for securing sufficient concentration of lactic acid. Gruber and Kretschmer (15) and Guglielmetti (17) followed the perfusion of lactic acid and acid potassium phosphate with a perfusion of adrenolin. Marked recovery was manifested in nearly every case. Gruber (16) found that epinephrin counteracted fatigue produced by acid sodium phosphate, but in all cases vaso-constriction was so great as to cause almost complete cessation of the passage of the perfusion fluid through the muscle. Wahl's results (42) indicate that muscular fatigue raises the creatinine output.

Dawson (10) studied his own cardio-vascular reactions during physical exercise and fatigue. He found that training decreased the pulse in rest and increased the diurnal variations in systolic and pulse pressures. The feeling of distress during exercise had no relation to the heart rate and blood pressure at the cessation of the exercise. When distress followed the exercise, it had no relation to the blood pressure, but the heart rate was greatly decreased. Young, Breinl, Harris and Osborne (43) compared the effects of light and prolonged exercise with hot room experiments. The results indicated that the exercise and humid heat cause a rise in blood pressure, pulse rate and rectal temperature. Burnham (9) reviews the literature on optimum humidity investigations. Viale (39) attributes the troubles of temperature regulation during exercise to exhaustion of water in the tissues. Mendenhall (30) fatigued frogs by compulsory exercise and measured the threshold of irritability of the heart, and found that with extreme fatigue there is first a decrease in irritability followed by a rise. Moderate fatigue caused a marked rise.

Respiration during exercise on a bicycle ergometer was studied by Amar (2). He used a valve respirometer of his own invention. The curve of pulmonary ventilation rose during exercise and reached its maximum in three minutes and then maintained a constant level. On cessation of work the curve descended to normal as quickly as it rose. Krogh and Lindhardt (22) tested respiration before and after the exercise on the bicycle ergometer. The oxygen deficit caused by the lagging behind of absorption in the first minutes of work was not compensated for during the work, but could be measured when work ceased.

Benedict and his associates (5) reduced the diet of college men

and noted their mental and physical efficiency over a period of three weeks. No adequate tests were used, but it is reported that the diet did not interfere with college work. Similar data were gathered by Krogh (21) concerning fat and carbohydrate diets.

Benedict and Johnson (6) and Longworthy and Baratt (23) conducted experiments in respiration chambers to determine the energy loss of young women during light household work. In the former experiment forty persons were used at one time. The increment in heat production during reading, standing, hemming, singing, dusting and sweeping was increased regularly in the order of the work named. Similar results were obtained in the latter experiments.

While the work in these experiments was of a somewhat make-believe sort, Waller and de Decker (40, 41) measured the energy loss in tailors and dock laborers at their regular work. The output of  $\text{CO}_2$  was determined every hour throughout the day and in the case of one dock laborer the tests were continued for a week. Stated in terms of calories per square meter of body surface, the dock laborer produced 170 calories and the tailors averaged 32.4 calories per hour. The curve of production for the dock laborer increased during the morning and afternoon, the increase being greater in the afternoon.

The war industries have been the occasion for several investigations of efficiency involving fatigue and health, particularly in this country and England. Vernon (38) analyzed 50,000 accidents in munitions factories in England. He concludes that the fatigue of a twelve-hour day may increase the accidents among women workers two and a half times above the ten-hour-day level. Among men no difference was shown. A similar analysis (37) of the effect of a long work day on production showed that a reduction of hours increased not only their relative production, but their gross production. This was true of both men and women workers. Observations of Amar (1) lead him to estimate the physical work of women at forty per cent. of that of men. That her curve of endurance is low and irregular he assumes to be due to her intermittent cerebral activity. The metabolism of female munitions workers and the demands of the various types of factory work were studied by Greenwood, Hodson and Tebb (14) and Rosenheim (32). The various tasks in the munitions factory were divided into four classes and the required number of calories per hour determined. There was considerable variation in the results.

Kent (20) and Lee (25) have investigated industrial fatigue under war conditions in this country. Kent tested complex reaction times, acuity of vision and hearing and blood pressure. Close observations of workers were also made. Overtime proved inefficient. Application to work fell off markedly as the day progressed, particularly in the afternoon. Monday, following a day of rest, showed no fatigue. Lee investigated munitions factories "from the physiological standpoint" though he does not make clear, in this report, just what this method is. The curve of output was found to vary with the character of the work. Where close attention and exact muscular coördination, the output curve of the individual during the first period resembles that of a single excised muscle. In a markedly muscular operation there seems to be a steady fall from the first. In some cases ten minute rest periods were advised. The output was uniform from day to day and week to week. It was believed that the men never reached their physiological limit. Lord (28) believes that efficiency lies in the mental attitude. Worry and fatigue are more or less confused.

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## REACTION TIME

BY V. A. C. HENMON

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Gatewood (2) investigated the speed and accuracy of the reactions of the fingers of the two hands in response to visual stimuli. Following an historical summary, the bearings of the results on development of technique in the playing of musical instruments are discussed. Individual differences are marked, both in speed and accuracy. The effect of practise, instead of resulting in a uniform increase with each finger, is to equalize the reactions of the several fingers. Reactions of fingers on the right hand (in right-handed persons) are on the average faster than those on the left hand, while differences in accuracy are slight. The effect of combining reactions is to increase speed and accuracy. Two-finger reactions, at least where there is a double stimulation, are faster and more accurate than single-finger reactions. Two-hand combinations give faster reactions than combinations in which both fingers are on the same hand.

Braendle (1), of the Cambridge Psychological Laboratory, describes a new voice reaction key that may be used with the Hipp chronoscope. For the description and diagrams reference must be made to the original paper.

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## ESTHETICS

BY RUDOLF PINTNER

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Hartman (9) presents a systematic treatise covering the whole field of æsthetics, and in particular raises the question as to what, to the discriminating individual, constitute the elements of interest in painting, music, or poetry. The author's endeavor, according to his statement, is not to increase art appreciation. He sets himself the much more ambitious task of attempting to "correct the methods so long in vogue for determining the substance, origin and value of art." The book is written in a controversial spirit, showing little patience with the psychological studies bordering upon æsthetics. Instead of trying to evaluate them for what they are worth, he tends to blame them for not going further. He deals critically with the hedonistic, expression, and experimental theories of art, as well as with the nature, origin, and value of art, the relation of art to truth and to morality, and similar topics. The three concluding chapters of the book deal with the author's theory of art, which he calls the empirical theory, as applied to painting, poetry, and music.

In a long theoretical treatise, Hamann (8) discusses the fundamental basis of æsthetics, dealing at length with the methods of æsthetics. Another theoretical article covering the general field of æsthetics is that of Bullough (3), in which special attention is paid to the specific problems of psychology. This is a study of the conditions of mind in which we call certain things beautiful. He pleads for a more intensive study of the artist himself as well as of the objects of art, and he calls attention to the need of comparative æsthetics, by means of which we could check up our European theories against the art of nations that have been uninfluenced by European civilization, *e.g.*, China.

Two other theoretical articles are contributed by Lethaby (14) and by Dunlap (5). Lethaby discusses in a popular way the question of what is beautiful, and brings it into close relationship with practical life. He opposes the Aristotelian conception of Fine Art as being free of utility. "Art is service before it is delight; it is labor as well as emotion; it is substance as well as expression." "Art has everywhere developed from what were supposed to be

utilitarian purposes." "Art is complete and noble workmanship." Dunlap does not attempt such a wide scope but limits himself to a discussion of the significance of human beauty for the race. This leads to a very interesting discussion of the negative and positive characteristics of the beauty of the human body, taking up such details as bodily proportions, the features, hair, complexion, and so forth, and leading to the conclusion that beauty is "the sign and the expression of the potentiality of the individual"—what he is capable of doing for the species. Prettiness is differentiated from beauty by the possession of a few characters of beauty which, however, promise little for the stamina of the race. Real beauty is, therefore, something vitally important for the human race.

Four experimental studies dealing primarily with pictures are reported. Otis (15) investigates the conditions that favor the apperception of the manifold in a unit, since "the inner agreement of meaning in the manifold is essential for the beautiful object." Tachistoscopic presentation of small cardboard forms in different arrangements is the method of procedure. The factors studied are size, contiguity, color, and the like. Cattell, Glascock and Washburn (4) had various groups arrange in order of "desire for ownership" 36 Cosmos prints ranging from the sentimentally popular to the technically great. The group of students having artistic training, and the group without artistic training but with interest in art, both correlated about  $+ .4$  with the order of the pictures arranged by experts. The group of students with no training or interest in art correlated  $- .11$ .

The next two studies deal with children. Berliner (2) had groups of children in grades 3 to 8 rank 16 picture postcards. She finds that the ranking order is to a high degree the same for all grades and for both sexes. The correlation of the order for children with the order for university students is, however, negative. She, therefore, concludes that there is a distinct break in æsthetic preference between the elementary school and college. This, she maintains, is not due to social standing but to age, in spite of the fact that the children were all inmates of an orphan asylum, and that she had no control group of children in a school of high social standing. Pintner (16) had 178 children, ages 6 to 14, and 83 adults rank pictures in order of preference. The six pictures were six different executions of the same theme, ranging from very good to very poor. He found that conformity to æsthetic standards develops early and increases gradually with age. He found no

such sharp break as reported by Berliner, although it is to be remembered that Berliner had pictures of different subjects, whereas Pintner's pictures were all of the same theme.

Dealing more specifically with music, there are seven titles. Lee (13) deals in a popular way with what music does in the mind of the hearer. He studies this by the questionnaire method, but does not present his results statistically. He finds, of course, that some listen to the music specifically and others remain more passive and let the mind wander, and he might have added that these two modes of response, as he calls them, shade off into one another, according to the mood of the observer and the type of music presented. Feldkeller (6) deals with somewhat the same problem but in a more subjective manner. He emphasizes the participation of the intellectual processes in the enjoyment of the best music. He draws a comparison between the style of music and the prevailing type of thought and philosophy of the period. His article is a protest against the over-emphasis of *einfühlung* and feeling in æsthetic enjoyment.

Beaunis (1) discusses the emotional element in music. He deals with the emotional effects of rhythm, duration, intensity, pitch, timbre, and the general sympathetic vibration of the body. Musical emotion is conditioned by three factors (1) the particular mentality of the listener; (2) the auditory sensations (æsthetic element); (3) the organo-muscular and tactile sensations (passionate element).

Seashore's (20) book is by far the most important contribution to the psychology of music during the last few years. It is, furthermore, a very distinct contribution to vocational psychology. It sums up, in practical form, much of Seashore's work. This brief notice must suffice here, as it has already been reviewed at length.<sup>1</sup> Pond's (17) study is a detailed account of the particular difficulties involved in the study of the French horn, and his chief conclusion is that "improvement in the technique of instrumental music may thus result from an efficient employment of the method of introspective analysis."

The effect of different kinds of music on the heart and blood pressure is investigated experimentally by Hyde and Scalapino (10) in a short preliminary article. The minor tones of a symphony increased pulse rate and decreased blood pressure. The Toreador Song had a stimulating effect upon the circulation by increasing

<sup>1</sup> PSYCHOLOGICAL BULLETIN, Vol. 16, No. 10, October, 1919, pp. 352-355.

blood pressure and pulse rate. "It is possible that a careful selection of music may be a beneficial aid in the treatment of nervous disturbances." Finally Thomas (21) in a short note contributes nine native songs from southern Nigeria recorded in our musical notation along with a record of the rise and fall of the tones in the spoken words. He finds from the examples recorded hardly any connection between melody and tone.

Of articles dealing with literature, we have two. Reicke (19) gives a description of the soul of the poet and author. He discusses the type and power of the imagination, the increased sensitivity of the sense organs, the presence of different kinds of imagery, and supports his arguments by numerous examples in prose and verse. Jelliffe and Brink (12) analyze from the psychoanalyst's point of view the use of the dream made by Barrie in his play "Dear Brutus." Dreams reveal our unknown desires and so "Barrie draws the curtain from the desires in their nakedness." But he also introduces Lob into the play, so that he, as the dream itself does according to the psychoanalyst, may arouse the mind to its own best possibilities. The authors thus interpret Barrie's play from the point of view of modern psychoanalysis.

Among miscellaneous articles touching on Aesthetics, we find Geiger's (7) estimate of the work of the late Theodor Lipps. He attempts to sum up the salient points in Lipp's work and to place it with reference to philosophy and psychology. Jelliffe (11) interprets art as a therapeutic agent both for the artist and the spectator. In Freudian terms it may be a harmless discharge of repressions or a sublimation on a very high level. There is also a symbolic interpretation of the colors and of the subjects chosen by the artist. Read (18) in a short note, written during the war, refers to the possibility of using the suitable personnel in the British armies to take note of all works of art in occupied countries, and in this connection he is thinking largely of the opportunities for such with reference to primitive or ancient art in Palestine, Mesopotamia, Egypt, and East Africa.

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## THE APPLICATIONS OF PSYCHOLOGY TO INDUSTRY

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Psychology as applied to industry is today on the defensive, partly because industry has expected quick, concrete returns, whereas psychology could offer only piecemeal, tentative conclusions; partly because psychologists have approached industrial problems with an assurance which they were unable to realize in actual practise. On the part of business men there has been a failure to appreciate the necessary refinements of the psychological methods. On the part of psychologists there has been a failure to understand the intricacies of industry. There have been many application.

of psychology *to* industry, but not so many *in* industry. For this reason, the literature of the past two years is rather meager in proportion to the expectations that have been aroused. Probably it is still too early to expect published results from those who have entered the field of industrial psychology since the war. On the other hand, some of the most significant results published have been achieved by men who are not professional psychologists. In general, it may be said that industrial psychology is passing through a period of sophistication which is limiting the science in some directions but extending it in certain other directions. An encouraging development which promises much for the future is the establishment in many schools of business administration and other technical schools, of departments of applied psychology.

*General Literature.*—A revised edition of Muscio's *Lectures on Industrial Psychology* (25) is notable for the prophetic emphasis which it gives to the attitude of trade-unions toward applied psychology. This is a factor which American psychologists will probably come to regard with increasing seriousness. The book is also valuable for its intelligent discussion of applied psychology in its relation to various phases of scientific management. Aside from this, it suggests ways in which psychology *may* accomplish results in industry rather than results already achieved. Meyers (21, 22) and Frost (11) also point out ways in which psychology has been or should be applied to industry. What should be is often far from what can be; and if, as Frost claims, industry demands a race psychology which will contribute to the solution of racial difficulties, it will probably be disappointed for some time to come. Meyers short book outlines a program which is not so ambitious but which indicates nevertheless a considerable faith in the future of psychology as applied in industry and in other fields.

A distinctive contribution to the speculative literature of industrial psychology is made from the psychiatric point of view by Southard (36, 37, 38). His theme is that industry is ripe for the industrial psychiatrist. He develops this theme rather by an eloquent elaboration of industrial woes than by a statement of what the psychiatrist can actually do. His most striking example is drawn from a study by Ball (2) in which the latter says: "According to the records, every one of the strikers had something wrong with him from a nervous or mental standpoint (nearly all having a psychopathic history); it was noted that with three exceptions the 'strikers' cited as agitators were among those grading the highest

on the intelligence scale used." From a totally different but still highly relevant point of view, Brierly (4) analyzes the reasons for a prevailing suspicion on the part of employees toward psychologists. The underlying cause for this suspicion is the association of the psychologist with the tendency in industry to mechanize the worker, to warp his balanced development. "Is it psychologically possible," she asks, "to have docile, extremely controlled workers in industry, who are yet free, intelligent, and responsible members of a democracy outside of it?" In view of the dangers implied by this condition, Brierly sounds a timely warning against a tendency of psychologists to allow the immediate, practical needs of industry to dominate their outlook and so diminish their scientific autonomy.

In view of this warning, psychologists may well read with tolerance the opinions of Tead (39) and Marot (20). The description of the instincts in industry by the former may not be sound from a psychological point of view, but it will nevertheless give to the psychologist very valuable information about industrial conditions. The same may be said of Marot's intensely interesting little volume which describes industry as increasingly mechanizing the worker and destroying his creative instincts. (The creative instinct or impulse is bearing a pretty heavy load in current industrial literature.) In general, it may be said that the psycholanalytical viewpoint, even if crudely applied, is a valuable check to the more coldly objective attitude which characterizes the 'test' method. The essays of Carleton Parker (27) are, of course, the notable contribution to this point of view, combining as they do, in an admirable degree, actual contact with industrial conditions and psycho-economic speculation.

*Interest in Work.*—Closely related to this aspect of industrial psychology is the question of interest in work. From the psychoanalytical point of view, interest depends naturally upon the satisfaction of wishes, instincts, etc. Kitson (16) however, shows that interest in a thing may be developed by means of extending information about it, and he applies this principle to certain concrete industrial problems. Wolf (46) makes a very valuable and suggestive contribution to this problem. By providing workers with graphic charts describing the elements of their task, he aroused their interest to a remarkable degree and greatly increased their output. There is a large field for psychological experimentation here which has been practically untouched by industrial psychologists, though the principles involved are fairly definite parts of psychological dogma.

*Army Tests.*—So much has been written about the army tests that it is unnecessary to review them in detail here. The manual on Mental Tests prepared by Yoakum and Yerkes (47) will prove of inestimable value to every psychologist who is interested in mental examination, whether in industry or elsewhere. It is crammed with excellent tests and devices. The tests requiring little or no language ability are particularly significant for industrial use. The reviewer has seen the manuscript of Chapman's (9) forthcoming book on Army Trade Tests which is a companion piece to the one just mentioned and gives extremely valuable information about the details according to which trade tests are developed and applied. Toops and Pintner (28) point out a positive correlation between degrees of education and degrees of trade ability. Robinson (31) points out certain factors underlying the construction of trade tests. Chapman and Toops (8) show a successful application of the written trade test. Bingham's (3) account of the army personnel work ends by calling attention to the importance of job-specifications in industry, a condition which is being recognized with increasing vividness.

*Employment.*—The bulk of recent literature deals with problems of employment. The most comprehensive account of what is actually being done in industries in this field is given in two reports (1, 30) based on investigations made by a committee of the National Association of Corporation Schools. These investigations extended to over two hundred of the largest corporations in the United States and brought to light some very interesting and valuable information about the manner in which psychology was being applied under different industrial conditions. An extensive application of tests in a rubber tire company is described by Burt (5). The account is particularly valuable because it combines a mastery of applied technique with the actual experiences of the psychologist in putting his technique into effect. Burt briefly mentions many problems which are characteristic of an attempt to develop employment tests and put them into effective operation in an employment office. An account of psychology as applied to various phases of employment is given by Link (19). This book describes the actual establishment, including rating scales, training schools, individual activity records, job-specifications, and occupational tests, of a comprehensive employment technique in a large manufacturing concern.

Thurstone (42) describes the results of an experiment with 165 drafted men who registered for a night course in radio-telegraphy.

The tests given were compared with a daily progress report based on the subjects' receiving ability. Two tests in particular, an ingenious rhythm test modelled after the rhythms found in telegraphic sending and receiving, and an opposites test, gave significant correlations. The writer states that "the general intelligence tests are not as valuable for diagnosing ability to learn telegraphy as for general intelligence." Also that years of schooling have no apparent connection with ability to learn telegraphy, though schooling is a good criterion for the selection of wireless repair men. An interesting experiment with clerical workers by Carney (6) led him to conclude that highly specialized tasks may require particular ability which is discoverable only by tests designed for that purpose. For such tasks general intelligence tests are increasingly useful the higher in the organization scale these are applied. Thurstone (41) devised and standardized a clerical examination which was given to 100 employees of a large insurance company, the results being compared with the grade of office work in which the subjects were engaged. Insufficient data regarding the manner in which the correlations given were obtained make it impossible to evaluate this experiment. It may be said that underlying the use of such a standardized clerical test is the assumption that there is such a thing as general clerical ability. Whether this is true or not, it is a fact that the subdivision of clerical work in industry has been such that an employment office is constantly on the lookout for special rather than general clerical ability. Where job specifications for clerical work have been made, it has generally been revealed that the simple term *clerk* is a very general class name loosely applied to a considerable range of work involving many special abilities in widely varying degrees. No general clerical examination can do justice to this situation. Flanders (10) found no significant correlation between the general intelligence of express clerks and their degree of success. Some interesting problems in the learning process of typists are described by Chapman (7). A comparison between tests given by Toops and Pintner (28) to unemployed men with the grades at which the men left school leads to conclusions which would be expected. A set of tables to facilitate the computation of coefficients of correlation by the rank difference method prepared by the Scott Company (32) is a valuable convenience.

*Rating Scale.*—Rating scales are used by as many as, and probably by more industries than, use psychological tests. The investigation upon which this statement is based (1) gives an account of



various types of scales now in use, and some of the results which have been obtained. The term "rating scale" is called a misnomer, since it implies qualities of accuracy which the scale obviously does not have. The term "opinion record" is suggested instead. It is now generally agreed that the value of the rating scale is educational rather than diagnostic. Thorndike (40) nicely describes the constant error which affects all ratings by the term "aura." The probable effects of the aura are described in another way by Kitson (15) who shows that the use of two very dissimilar scales by the same people produced almost identical results. Kitson suggests a more careful analysis of the rating technique than has been made. A unique method of mutual rating is described by Shelton (33). All ratings are made by secret ballot, and every individual is rated both by his inferiors and superiors. This fascinating paper raises some very important questions, both from the point of view of psychological technique and industrial management.

*Fatigue in Industry.*—In a very fine monograph on the problem of fatigue, Spaeth (35) estimates the value of psychological fatigue studies to date as nil. Spaeth (34) also calls attention to the fact that the term fatigue as generally used by psychologists and physiologists has no practical value. A study made by Wyatt and Weston (45) in a cotton mill, covering a period of four weeks, with only four operators, shows the extreme intricacy which characterizes a fatigue study under industrial conditions. It was found that contingent factors were so numerous as to make it practically impossible to isolate any fatigue factor. In spite of the fact that the test used resembled the actual operation of winding to a very minute degree, it took three weeks before the effects of practice became negligible, and at the end of four weeks when the experiment came to a close these effects had not entirely disappeared. Finally, it was concluded that it was impossible to determine by the test used, the amount of fatigue produced in any individual by the industrial conditions under consideration. One of the features of this study was a diary in which each subject kept a record of the events of the entire day. A fatigue study made by Link (17) in which three tests were given five times a day for three weeks to 40 girls engaged in the visual inspection of shells gave results that could not be interpreted in any consistent manner. The most obvious result was the persistence of variations due to the learning process even at the end of three weeks. Later, the hourly pro-

duction or output of the same 40 girls was studied every day for a period of 3 weeks. The resulting composite production curve differs radically from the conventional fatigue curve for work of this nature. Production increased throughout the morning reaching its height shortly before noon. Directly after the luncheon hour production, instead of starting with an increase, started with a very marked drop. However, it gradually increased reaching the highest point for the day at 5:30 P.M. (Circumstances in connection with this study made it possible to obtain figures which showed that a group of 40 shell inspectors performed 3.6 per cent. more work per hour while working 10 hours a day than they did while working only 8.6 hours.) Muscio (25) adds to the evidence a study which shows that the value of fatigue tests is doubtful because the degree of fatigue present when the tests are applied is unobtainable. His results corroborate those obtained by Link in that they afford no evidence that fatigue, as judged by diminished capacity for work, is progressive throughout a day's work. Muscio's conclusion that the output of working subjects at any given time must be compared with that of resting subjects at the same time complicates the problem still further.

In this connection the importance of the work done by F. B. and L. M. Gilbreth (12) is not sufficiently recognized by psychologists. These investigators are not concerned with the theoretical problem of fatigue but with the practical steps which may be taken to reduce it. Acting on the general principle that all lost or unnecessary motion is a waste of energy, they have devised a beautiful technique for recording the movements which characterize individuals in certain situations, and subsequently eliminating those movements which are superfluous. This is one way of applying a technique to industry even though it may not be psychological in the conventional sense of the term. As a matter of fact, the Gilbreths are the ideal behaviorists. Unlike Watson, they do not even have to exert themselves to eliminate the terminology which introspective psychology has given rise to. They are concerned merely with movement, that is, the response of an organism to a certain set of occupational stimuli. Watson, in discussing the fatigue concept, (44), recommends that it be eliminated because it is no longer serviceable. He asserts that the psychological division of work into mental and physical has brought the psychology of fatigue to a helpless position. The Gilbreths, true to their technique, have never even concerned themselves with the psychophysical concept

of fatigue. Nevertheless, they have probably done more than anyone else to eliminate waste motion.

*Psychology and Rate Setting by Time Study.*—A new application of psychology to industry is suggested by Link (17) in connection with the prevalent method of setting tasks in industry. The procedure of setting a task for a group of workers is one of the most common and one of the most important problems in industry. In spite of attempts to reduce this procedure to a scientific basis by means of stop watch studies and a certain statistical treatment, it still remains largely rule-of-thumb. More than that, the so-called time-study method often contains elements which are not only scientifically unsound, but contrary to the dictates of common sense. This is exactly the type of problem which the psychologist should be able to handle, and offers a field for some original and very valuable contributions. Here are a few of the questions which are to be answered: In setting a task for a group of, let us say, fifty operators, how many individuals should a preliminary study be based on in order to arrive at a satisfactory task rate? How should the individuals chosen for the study be selected? How long should their work be observed? How far above the average ability should the task be set? What allowance should be made for practise and fatigue? These are only a few of the questions which have so far been left to guess work or personal opinion under scientific management. Underlying the whole problem of setting tasks is the problem of the *one best way*. Here again the most valuable work has been done by investigators who are not professional psychologists, notably the Gilbreths (13).

*Industrial Psychology in Germany.*—There has recently appeared in Germany a new Journal called, *Practische Psychologie*, edited by Dr. W. Moede (23, 24) and Dr. C. Piorkowski (29) of the Charlottenberg Advanced School. The first two numbers are given particularly to the description of new apparatus which has been developed for the examination of machine tool apprentices. This apparatus is designed specifically to meet various trade requirements and seems by far the best devised thus far for distinctly industrial applications. As yet, the actual work of testing this apparatus has not been extensively carried out, though initial steps of a very extensive program are already described (24). Tremendous importance is attached to the possibilities of this work by Schlessinger (32), in the first article of this new journal, even to the extent of regarding it as one of the chief cornerstones of a new and

greater Germany. The vocational viewpoint seems to dominate this group whereas American psychologists have certainly drifted away from the vocational approach. Still, Tramm (43) has an extremely interesting and practical study describing the systematic training of street car motormen according to the methods of applied psychology. The apparent energy and thoroughness with which this group is attacking its problems, promises some very fruitful results.

*Other Applications.*—The application of psychology to advertising and aviation, both of which are in a sense industrial, have been passed over here because of the fact that they are distinct fields requiring a special treatment which the scope of this review does not permit.

*Popular Literature.*—Applied psychology has reached the stage where it is proving valuable material for the pseudo-scientific pot-boiler. The mass of stuff written in this vein cannot be reviewed here. Probably this literature has done more good than harm, though for the present it has resulted in associating applied psychology in the minds of the public, including the industrial public, with character analysis, hand-writing interpretation, phrenology, and mental slide-rule reading. "*Measure your mind*" is the most common headline for magazine articles requiring a *punch*. Psychologists themselves are partly to blame for this, not so much because of the kind of publicity they have invited as because of the deceptive simplicity with which they have described or captioned their work. But by far the most important reason for the popular misunderstanding of psychology is the character of psychology itself. The applied psychologist, under the rapid fire questioning of people interested in his work, cannot avoid realizing how extremely vague and subjective the body of psychological doctrine really is. Such words, for example, as memory, judgment, determination or will power, mental, reason, perception, association, intelligence, concentration, etc., are all common, everyday terms which psychology has not yet loaded with a distinct, scientific content. Instead of being an aid, they are a great hindrance to applied psychology: in the first place, because they tend to give the student of psychology a misleading idea about the simplicity of mental traits; in the second place, because the applied psychologist is expected by industry to explain the very specific results of his experiments in terms of these vague psychological generalities. For instance, imagine a psychologist trying to measure an indivi-

dual's degree of concentration! The layman understands with difficulty that concentration is an abstract, descriptive term covering a wide variety of phenomena; that the psychologist can only measure the quality of an individual's response to tests *a, b, c, or d*; and that the inferences which he may draw from these measurements are very limited indeed.

In view of these facts, Watson's (44) treatment of the traditional psychological concepts may be considered one of the most important of recent contributions to the literature of applied psychology, whether in industry or elsewhere. His treatment of the fatigue concept has already been mentioned, and is typical of his treatment of other conventional psychological terms, many of which he drops entirely because of their hindrance to his attempts to reduce psychological phenomena to definite, objective terms. Naturally, this course involves initial clumsiness and inconvenience, but as far as applied psychology in industry is concerned, these inconveniences have long been felt. What is needed is a logical, clear-cut, point of view in order that the present chaos may be finally reduced to a body of consistent and objective psychological data. Watson's work is, in fact, the conscious methodology which practically all recent literature on industrial psychology has more or less explicitly implied.

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## DREAMS

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The literature on dreams published since 1916 may be characterized generally as unremarkable. It is devoted essentially either to the criticism, explanation, or illustration of the Freudian thesis. One real contribution, however, in the first class, is offered by Horton (11) who maintains that the levitation dream is a mental reaction to the changes in the sensorium produced by dilatation of the blood vessels after the short-lived constricting effect of adrenin, which is automatically aroused in response to chill. The dreamer's interpretation of the sensorium accompanying the action of adrenin itself accounts for the "angry Sheik" and "insufficient clothing" dream that so frequently precede the flying dream. Kinesthetic repose and the mid-state of attention are respectively the physical and psychical conditions requisite for such interpretations of these sensorii. The author has experimentally produced these conditions and occasionally experienced, along with them, illusions of flying, falling, and kinesthetic revelation.

Platt (17) and Kollarits (14) likewise list themselves as critics of Freud. The former suggests a somatic theory of dreams. He assumes that the conscious brain centers are more readily fatigued than are the perceptive centers, and need therefore more rest. At that period, then, when the perceptive centers are rested and awake, and while the higher centers sleep on, any stimulation will set off phylogenically and ontogenically facilitated brain paths in the perceptive regions. The hazy and irrelevant outline of dreams is caused by the "dragging in" of surrounding areas. The implications presented in this theory upset the whole foundation of orthodox psychology. Platt is aware of the difficulty but does not, in my estimation, cope with it successfully. The latter (14) treats of three kinds of dream assimilations. The first, the weaving into the dream of outward stimulation, such as a voice speaking to the dreamer, occurs only in light sleep, and the spoken words in Kollarits's experiments were disposed of in the dream as imposed, foreign material. The two other kinds of assimilations: the melting of one dream picture into another, and the representation of two different places or persons as one, are incompletely explained.

The very fervid anti-Freudians, Mott (15), Weber (21), Armstrong-Jones (2), direct their ire against the sweeping sexual interpretation of all dreams. By an appeal to the literature of "by-gone" days when no ban was put on free references to sexual matters, and partly by appeal *ad hominem*, they show that the activities of life expressing the self-preservation instinct—eating, exercise, reactions to fear, horror, etc.—are more fundamental than those connected with the instinct of the preservation of the species (sexual instinct) and are thus bound to be represented in the dream as frequently as the latter. Also, the artificial nature of symbolism precludes a recognition of the limits within which it may be legitimately used.

Strictly Freudian are the many clever interpretations of dreams with the introduction of new symbols: (6), (13), (19), (5), (7), (18), (1).

In addition, Ferenczi (8), by analysis of two types of dreams—one apparently unsexual but accompanied by unconscious bodily sexual expression (pollution), the other very apparently sexual but not accompanied by bodily sexual activity—demonstrates the rule that "it is only the strong *unconscious* wish that has access to bodily expression, while the *foreconscious* wish may release only psychical events."

Besides confirming experimentally many of the Freudian teachings, Abraham (1), by short exposures of pictures in the tachistoscope, produced in the dreams of normal persons the same "Nachlieferungen" that are observed in psychopathic individuals.

Another of Freud's tenets, namely, that the adult sexual constitution is formed from the original undifferentiated sexuality (bisexuality) of the human child, is evidenced by hermaphroditic dreams. Coriat (3) emphasizes the importance of these dreams as indicating a good prognosis in the course of the psychoanalytic treatment of homosexuality. They mark the first (neutral) stage of recovery after the definitely pathological homosexual dream; the second stage, or complete recovery, being signified by the heterosexual dream.

Attention is called in several papers (9), (20), (19), to the striking resemblance between the understanding and treatment of dreams, delusional states and mental conflicts in certain works of literature, and the Freudian interpretation of these mental processes. Freud (9), for example, analyzes the actions and dreams of the hero of the novel "Gradiva" and points out their conformity to those of the actual neurotic, as he understands them.

The whole subject of dreams has been put in commendable form both for the layman and for the student of psychology in several comprehensive but short and lucid treatises (4), (12), (16).

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## NOTES AND NEWS.

Dr. H. J. HUMPHSTONE, formerly of the University of Pennsylvania, has been appointed professor of psychology at the University of North Dakota.

Dr. L. R. GEISSLER, formerly of Clark College, has been appointed professor of psychology at Randolph Macon College for Women, Lynchburg, Va.

Dr. H. M. JOHNSON has been discharged from the Army and has accepted a position with the B. F. Goodrich Company, Akron, Ohio where he will carry on research in some problems of vision of importance in factory lighting.

THE following items have been taken from the press:

WILHELM WUNDT, professor of philosophy at the University of Leipzig, where he established the first laboratory of psychology, died on August 31, in his eighty-ninth year.

Dr. CHARLES MACFIE CAMPBELL, assistant director of the Henry Phipps Psychiatric Clinic, Johns Hopkins Hospital, had resigned to become professor of psychiatry at Harvard Medical School and director of the Boston Psychopathic Hospital.

Dr. SHEPARD IVORY FRANZ, of George Washington University and the Government Hospital for the Insane, and the editor of the BULLETIN, represented the American Association for the Advancement of Science at the recent Cardiff meeting of the British Association.

THE forthcoming establishment in the University of Paris of an Institute of Psychology is reported. The Institute will be administered by a council composed of Professors Delacroix, Dumas, Janet, Pieron and Rabaud, and the deans of the faculty of letters

and sciences. It will afford instruction, both theoretical and practical, in general, physiological, experimental, pathological and comparative psychology. It will be attached to the recently established Institute of Pedagogy, forming its pedagogical section. Other sections of the institute, dealing with the general applications of psychology and with vocational selection, will be formed shortly. The institute will grant diplomas to successful students in each of these sections and to those who, after attending other courses of instruction, have passed the examinations therein. It will also be open for research work in connection with the University doctorate or higher diplomas. Previously Professor Janet with his colleague, Professor Dumas, worked in psychopathology quite independently of the late Alfred Binet, who directed the psychological laboratory. Professor Pieron, Binet's successor, is now joining forces with the representatives of French pathological psychology, and the institute thus formed is also to encourage the applications of psychology to education and to industry.

The most meritorious research on *The Effects of Music* submitted to the American Psychological Association before June 1, 1921, will be awarded a prize of \$500. Intending competitors are advised to communicate with Professor W. V. Bingham, Carnegie Institute of Technology, Pittsburgh, Pa., from whom information regarding the conditions of award may be obtained.

